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FINAL REPORT SA-FR-8801

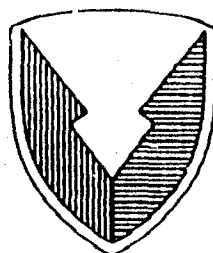
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SYSTEM CHANGE REQUEST COST MODEL

RICHARD E. MUSSER

January 1988

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U.S. ARMY ARMAMENT,
MUNITIONS AND CHEMICAL COMMAND
SYSTEMS ANALYSIS OFFICE
ROCK ISLAND, ILLINOIS 61299-6000

DISTRIBUTION STATEMENT A

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT Distribution Unlimited		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) SA-FR-9801			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Armament, Munitions and Chemical Command		6b. OFFICE SYMBOL (If applicable) AMSMC-SA	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Rock Island, IL 61299-6000			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) System Change Request Cost Model					
12. PERSONAL AUTHOR(S) Richard E. Musser					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM Jul 87 to Jan 88		14. DATE OF REPORT (Year, Month, Day) 88 01	
15. PAGE COUNT 19					
16. SUPPLEMENTARY NOTATION <i>Complete program</i>					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Cost Models, Cost Estimates, Cost Analysis, Cost Effectiveness, Economic Analysis, Life Cycle Costs, Computer Applications		
05	03				
12	05				
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report discusses a cost model developed at HQ, U.S. Army Armament, Munitions and Chemical Command, (AMCCOM). The Materiel Management Directorate, (AMSMC-MM) requested the model to help them improve the cost savings estimates contained in system change requests (SCRs) they submit for the Commodity Command Standard System (CCSS) and other computer systems per AMCR 18-17. Army Materiel Command, (AMC) Logistics System Review Committee guidance states the SCRs should contain estimated benefits that are the best that can be derived. SCRs are submitted by systems analysts with heavy workloads who are not cost analysis experts. Various auditors have criticized SCR estimates for inconsistencies and insufficient documentation. The report details the methodology used and provides supporting rationale. Operation of the model is discussed. The appendices include a listing of the prompts and user inputs for a sample run session plus the example's cost factor data input file and output file. (CONT) <i>Cost Factor Data Input File and Output File</i>					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED / UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Richard E. Musser			22b. TELEPHONE (Include Area Code) (309) 732-6370		22c. OFFICE SYMBOL AMSMC-SAS

DD Form 1473, JUN 86

Previous editions are obsolete.

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The System Change Request Cost Model was written in FORTRAN 77 for the PRIME computer. It is interactive with the user and provides instructions. It prints an appropriate error message and reprompts if the user makes an invalid input. It accepts all possible time units from seconds through years and negative values for time savings can be entered to reflect cost increases. Standard Army cost factors are used. Leave, holidays, and benefits are incorporated. Input files were developed for computing either government savings (economic analysis) or DOD savings (budgeting). Savings are computed for both cost avoidance of new hires and reduced overtime scenarios. Cost factor input data files can be updated in minutes when cost factors change. The model estimates salaries and/or the Medicare earnings cap using a pay raise factor if these values are not known for a future year. Detailed and summary savings tables are provided in the output. Documentation of the methodology and cost factors used for each estimate in sufficient detail that an auditor could verify all computations is provided in the output. Though developed for SCRs, the model is applicable to any type of analysis or initiative involving General Schedule personnel. Run time is very short.



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Report SA-FR-8801

SYSTEM CHANGE REQUEST COST MODEL

Richard E. Musser

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Systems Analysis Office (AMSMC-SA)
Rock Island, IL 61299-6000

January 1988

Final Report for Period July 1987 - January 1988

Prepared for

HQ, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
Materiel Management Directorate (AMSMC-MM)
Rock Island, IL 61299-6000

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I. INTRODUCTION

1. BACKGROUND.

a. Requester. AMSMC-MMP-SS requested that this office work with them to develop a cost model to help them improve the cost savings estimates in their system change requests (SCRs). AMSMC-MM felt that such a model would also benefit other organizations in AMCCOM that develop SCRs or other proposals where some type of cost savings estimate or economic analysis is required.

b. Definition. As the name implies, a system change request is a request to change a system. When most people hear the term they think of the most common form of SCR: a request to create, modify, or discontinue computer software. However, systems such as the Commodity Command Standard System (CCSS) involve more than just computer hardware and software. Thus an SCR could propose declassifying a term, changing a manual, changing the distribution of reports, or some other change not requiring computer programming support.

c. Current Situation.

(1) The Army Materiel Command (AMC) Logistics System Review Committee (LSRC) Policy Guidance #2 states that SCRs should contain estimated benefits that are the best that can be derived. AMSMC-MM does not have any cost analysis positions. SCRs are submitted by systems analysts who have the functional expertise necessary to estimate raw savings. However, there is no capability to perform a true cost analysis. In fact, even if the SCR preparers were cost analysis experts, their workloads are such that they cannot afford to spend the time that would be necessary to manually produce a detailed, highly accurate, and fully documented estimate of cost savings. Sometimes SCRs are directed actions to satisfy the needs of other organizations. Since the systems analyst knows these SCRs will be approved even though the changes will likely increase AMSMC-MM's workload, there is little incentive to spend much time on the estimate.

(2) Various auditors have criticized the estimates contained in AMSMC-MM SCRs. Since AMSMC-MM's system analysts do not have a data base of standard cost factors and time standards to use in SCR cost estimates, auditors easily find inconsistencies in estimates. System changes can produce savings by reducing the time needed to perform a function. However, if two SCRs relate to the same function and the SCRs contain significantly different estimates of the amount of time currently spent on the function, an auditor will assume that one SCR contains inflated time savings. By the same token, if SCRs use differing costs for manhours at the same GS grade, an auditor will question the costs. Insufficient documentation of cost estimates in SCRs can also cause major problems with auditors. Until an auditor knows what methodology was used and the source of all cost factors, he cannot properly evaluate an estimate. By the time the SCR is audited, the preparer may have changed jobs or forgotten exactly what he did. Unfortunately, properly documenting an estimate usually requires even more time than it takes to perform the calculations, so documentation is often inadequate.

2. OBJECTIVES.

a. Objective One. The first objective, which has been accomplished, was to develop a model that produces as output a documented cost estimate of the personnel cost savings or cost increase for an SCR from user inputs of estimated time savings or increases for affected AMSMC-MM personnel. This objective required minimal assistance from AMSMC-MM. AMSMC-CAR-V (Rod Bales) and AMSMC-CPF-AC (Warren Leatherman) concurred with the methodology and the cost factors used by the model.

b. Objective Two. The second objective, which will be worked on beginning February 1988, will be to develop baseline time standards for AMSMC-MM tasks for use with the model. AMSMC-MMP-SS (Bob Lewis) has stated that the completion date for this effort will primarily be driven by how long it takes AMSMC-MM to assemble necessary data.

II. MAIN REPORT

1. METHODOLOGY.

a. AMSMC-MM Guidance. AMSMC-MMP-SS provided a sample SCR for us to review. We had originally thought that possibly AMSMC-MM was required to perform a mini economic analysis for each SCR. Actually AMSMC-MM only submits an estimate of the cost savings or increases for AMSMC-MM, virtually all of which are personnel costs. The organization making the change could perform an economic analysis after estimating the costs to make the change. AMSMC-MM suggested that we put cost factors in an input file rather than in the model itself so they can be updated easily. We assured them that that is standard operating procedure. AMSMC-MM informed us that all their personnel that could be affected by SCRs are day shift GS employees. This greatly simplified the model since WG and military personnel could be ignored, as could night differentials. We needed a figure for the maximum number of personnel in a GS grade that could be affected by an SCR so we could get some idea of how big we should make various fields in the output. AMSMC-MM told us 100 would be a safe maximum figure.

b. Economic Analysis Programs. Prior to our learning that AMSMC-MM is not required to conduct a mini economic analysis, we visited AMSMC-CAR-S (Barb Caswell). We had heard that AMSMC-CAR had developed some economic analysis programs and we wanted to learn about them. Ms. Caswell discussed the programs with us, gave us a sheet of instructions, and told us where they were located on the PRIME so we could copy them. Outputs produced by the programs correspond to Format A or Format A-1 as shown in economic analysis directives. We tested the programs and found that they have universal applicability, are easy to use, and perform calculations accurately. All that is needed to successfully run the programs is a basic understanding of economic analysis. Since AMSMC-MMP-SS (Mike Johnson) was interested in the programs, we provided them with copies. The System Change Request Cost Model together with the economic analysis programs gives AMSMC-MM a capability that can be very useful in dealing with auditors--the capability to rapidly conduct a post investment analysis (PIA). A PIA is an economic analysis conducted using actual investment costs and actual recurring savings to verify that a project was an economic investment. AMSMC-MM could rerun the SCR Cost Model using actual manhour savings to get recurring savings and run one of the economic analysis programs using this value and the actual cost of the system change if an auditor ever questioned whether a system change was economical.

c. Commercial Activities System (CAS). CAS is a computer program that automates cost computations for Commercial Activities studies. We visited AMSMC-MGX (John Barrowclough and Don Wymore) to learn about this program. We reviewed the manual for CAS. The manual was useful as backup for our basic methodology. It assisted us in finalizing our methodologies for file structure and displaying costs. This manual would have been especially useful if we had been required to cost out more than just day shift GS employees.

d. New Hires and Overtime Costing. When a system change is adopted which enables AMSMC-MM to perform a function more rapidly, one of three things will occur. AMSMC-MM will either (1) keep the same workforce and accomplish more work, (2) abolish some jobs and accomplish the same amount of work, or

(3) reduce overtime and accomplish the same amount of work. Similarly, if a system change increases the effort required to accomplish part of their mission (a directed action), AMSMC-MM will either (1) keep the same workforce and accomplish less work, (2) hire additional people and accomplish the same amount of work, or (3) increase overtime and accomplish the same work. Usually economic analyses and cost estimates compute personnel costs based on the cost of new hires. SCRs are no exception. The System Change Request Cost Model computes personnel savings or cost increases both on the basis of new hires and the basis of overtime. Estimating both ways did not significantly increase the time needed to construct the model, require any additional inputs by the user to run the model, or perceptibly increase the run time. This methodology increases the number of potential applications for the model and provides additional information for an audit.

e. Hard Dollar Savings and Cost Avoidance. Per the previous paragraph, when a system change enables AMSMC-MM to perform a function more rapidly, one of three things will occur. This is somewhat of an oversimplification since in reality various mixes of increased output, personnel reductions, and decreased overtime are possible. However, the System Change Request Cost Model only computes two different values for total savings. This is possible since the Army views the first two alternatives as producing the same savings. Some people might argue that AMSMC-MM really does not save anything unless there is a personnel reduction and expenditures drop accordingly. Such savings are referred to as hard dollar savings. However, there is another type of savings referred to as cost avoidance. When a system change enables AMSMC-MM to perform more work with the same people, AMSMC-MM is avoiding the cost of hiring additional people to perform the additional work. The level of organization being referred to affects the issue of whether savings are hard dollar savings or a cost avoidance. If one refers to the function being performed instead of referring to AMSMC-MM, savings can be termed hard dollar savings even if personnel are not reduced. However, if one refers to total US Government expenditures, savings would probably have to be referred to as a cost avoidance even if AMSMC-MM reduced personnel, since it would be next to impossible to prove that total US Government expenditures fell as a result.

f. Cost Factor Input Data Files. Appendix A is the cost factor input data file for a sample run. The model uses just one input file containing cost factors when a run is made. We developed two input data files for use with the model. This allows the user to choose between computing savings for the US Government or savings for DOD. US Government savings are appropriate for use in an economic analysis. DOD savings are appropriate for use in budgeting. The files are small and differ only in two values. The DOD file contains a smaller factor for fringe benefits since for retirement it includes only the cost funded by DOD (7% of salary under the Civil Service Retirement System (CSRS)). Since the civilian retirement cost not funded by DOD appropriations is currently 20.9% of salary, US Government savings are much larger than DOD savings costing on the basis of new hires. DOD and US Government savings are the same costing on the basis of overtime because overtime earnings do not affect retirement. The only other difference between the two input files is that one file contains the value 'GOV' and the other contains the value 'DOD' to determine what text should be printed for portions of the documentation of the estimate. The first line in the input file contains the last two digits of the two years the user can choose from as a

year for the estimate. The second line contains the GS salary rates for step 5 of grades 1 through 18 for the first year. The third line contains the same salary data for the second year. If this data is not known, line two is repeated and the model will inflate the values by a pay factor if the user chooses the second year. The fourth line contains a factor to account for leave and holidays, medicare factors for each year, a fringe benefits factor, and a pay factor. It also contains the maximum amount of earnings subject to withholding for medicare in each year and the salary for GS 10 step 1 for each year. If the medicare cap or the salary for GS 10 step 1 are not known for the second year, the values for the first year are repeated and the model will inflate them by the pay factor. The medicare cap rises in line with the change in wage levels in the US for the previous year. Since it is not tied to federal pay raises, using the pay factor will only produce a ballpark estimate for the medicare cap. It is necessary for the model to receive a salary value for GS 10 step 1 because overtime salary cannot exceed 1.5 times the salary for GS 10 step 1. The fifth and last line of the input file contains the value 'GOV' if the file is used to compute US Government savings or 'DOD' if the file is used to compute DOD savings. It also contains the factor for civilian retirement cost not funded by DOD appropriations. This line is only used by the model to determine what text to print for portions of the documentation of the estimate.

g. Cost Factor Sources. The obvious source for GS salaries is the official GS federal pay scales. The use of step 5 as an average GS salary for a grade for estimating purposes has been the standard procedure for many years, and is supported by MACOM resource factor handbooks. The leave and holiday and fringe benefits factors are standard Army factors. They can be found in MACOM resource factors handbooks, AR 37-60 Pricing for Materiel and Services, and other publications. Medicare was separated from other fringe benefits for several reasons. The medicare factor for a year is known well in advance of the year. The medicare factors are legislated. However, there is no set schedule for updating other factors and they are changed with little or no advance warning. Thus one has to assume that other factors will remain the same indefinitely. Additionally, medicare is the only fringe benefit subject to an earnings cap, and it is the only fringe cost applicable to overtime earnings. Budget guidance is the best source for pay factors for future years. Only rare circumstances could justify use of a different pay factor prior to the enactment of pay raise legislation. The medicare cap for a year is determined by the Social Security Administration and released in November of the previous year.

h. FERS vs. CSRS. In 1986 the Federal Employees' Retirement System (FERS) was created. FERS took effect 1 January 1987. Employees first hired in 1984 or later are covered under FERS instead of CSRS. CSRS employees had until the end of 1987 to decide if they wished to transfer into FERS. Since indications are that few CSRS employees transferred to FERS, CSRS employees should be in the majority for several years. However, eventually all employees will be under FERS because of turnover. The existence of two retirement systems presents a dilemma for cost estimators. FERS and CSRS employee costs will be different. Nobody knows exactly how many CSRS employees transferred to FERS or to what extent FERS employees will participate in the thrift plan. The thrift plan will cost the Government somewhere between 1% and 5% of salary. The CAS costs on the basis of FERS

and uses a lower percent for retirement. Thrift plan and social security (but not medicare) costs for the Government and the contractor are ignored for cost comparison purposes. Since use of this procedure would obviously underestimate savings, we elected to use existing cost factors which are based on CSRS costs until such time as the Comptroller of the Army (COA) provides factors incorporating the impact of FERS. Mr. Leatherman and Mr. Bales agreed that it would be hopeless to try to incorporate FERS into the model at this time. Our analysis indicates that FERS costs will not be significantly different than CSRS costs for new hires. However, FERS costs will definitely be larger for overtime since overtime earnings are subject to social security under FERS. FERS may not even increase the uncertainty in personnel cost estimating since the factor for civilian retirement cost not funded by DOD appropriations has been volatile in the past. The model was constructed in a manner that will minimize changes that could occur because of FERS. The medicare factors in the input file could be increased to include social security. The fringe benefit factor could be adjusted to include the added thrift plan cost and reduced retirement cost. Then all that would remain to be done would be to change 'medicare' to 'medicare and social security' in headers and make minor changes to comment lines in the model and text for documentation of the estimate.

1. Documentation of the Estimate. The last section of the output produced by the model is a documentation of the estimate. The documentation is detailed enough that an auditor could verify the numbers in the cost tables. Time values are displayed in the tables to the nearest hundredth of an hour. However, the user can enter time units in any unit from seconds to years. The values are read free format and calculations are double precision. Thus an auditor could arrive at figures that are slightly different for savings numbers. The worst case would be a possible 17 cent difference for salary savings for a GS 18 at current salaries costing on the basis of new hires. Since it is desirable to create a como file when making a run, the auditor could use the como file if he wanted to verify that calculations are correct to the nearest cent. The model calculates savings values double precision but only displays them to the nearest cent. Thus total values displayed may not agree with the sum of the displayed component values due to roundoff. The documentation displays which year constant dollars were chosen for the estimates. The documentation text for different estimates can vary by more than changes in cost factors. Both the medicare cap and salaries can either be known or estimated using a pay factor. The methodology used by the model will depend upon what was known and unknown at the time of the estimate and the documentation produced by the model will vary accordingly. The model was tested by us using test input files reflecting all possible levels of knowledge to verify that in all cases the calculations are correct and the documentation produced is appropriate.

2. Output File. Appendix B is the output file for a sample run. The model produces just one output file. The first section contains user responses to prompts for submitting organization, date of submission, project title, description of project objective, and name and title of action officer. Project title was chosen as a prompt because the model can be used to calculate savings for any type of project, not just system change requests. The next section contains tables of annual cost and manhour savings by person within grade. For each grade in which personnel are affected by the project.

the model first prints out the grade, salary, and overtime salary. Next the column headers are printed. Next the values are printed for each person affected in the grade. Personnel are referred to by person number rather than by name. The values for each person given are direct manhour savings; total manhour savings including leave and holidays (does not apply to overtime); dollar savings for salary, medicare, fringe benefits, and the total dollar savings costing on the basis of new hires; and the dollar savings for salary, medicare, and the total dollar savings costing on the basis of overtime. The next section is a table of annual cost and manhour savings by grade and totals. First the headers are printed. For each grade in which personnel are affected by the project, the grade, number of people affected, and grade totals for all manhour and dollar savings values mentioned previously are printed. The last line of the table contains grand totals for the number of people and all manhour and dollar savings values. The final section of the output file is the documentation of the estimate as discussed in the previous paragraph.

k. Adaptability. The model was constructed in such a manner to make it quite adaptable. As was mentioned previously, it could be easily modified to cost on the basis of FERS if COA directs that personnel costing should be done on the basis of FERS. Changes in cost factors are not a problem for the model. The two input files the user can choose from can be updated in a matter of minutes. Since the model reads the values free format, changes in the number of decimal places for a factor do not create any problems. It would not be difficult to create a version of the model to compute total costs instead of cost savings. Minor changes would have to be made in user prompts and headers for tables. Calculating total costs would produce larger values. However, if values were expressed in dollars instead of dollars and cents, field widths would not need to be increased. A field that is currently F10.2 could be converted to F10.0. The documentation for the estimate would not need to be changed. The documentation currently refers to cost values instead of cost savings. The current model could be manipulated to provide the cost of a workforce. This would involve changing the holiday and leave factor to .00, changing the format statements to print values in dollars, and entering 1 year for each person's 'savings'. Overtime values would be inaccurate and not applicable. Portions of the headers and cost estimate documentation would no longer be accurate. However, the remaining values would be accurate.

l. Error Checks. It is frustrating to have to rerun a program or model just because a simple mistake or typing error was made during a run. For this reason many error checks were put into the model, even though run time is short. If a user enters an invalid GS grade, an invalid time unit, tries to enter data for a grade twice, or makes another invalid entry, the model informs the user of the mistake and lets him try again instead of bombing. The model will also spot one error in the input file. If the user inputs a new GS schedule but forgets to put in the new value for GS 10 step 1 used to calculate the maximum overtime salary, the model will point out the error and terminate processing instead of providing erroneous results. Users should set up a COMO file when running the model just in case an error is made in entering time values. This is especially true if time units other than hours are used since the output converts times to hours and thus errors may not be obvious in the output.

m. Limitations. The model has some limitations which we do not view as significant. For instance, a person cannot be compensated for overtime that would bring compensation for a pay period to more than base pay for a GS 15 step 10. This restriction was not placed in the model. AMSMC-MM told us this would not be a problem in view of the grades of personnel involved in SCRs and the amount of overtime being worked. Also military overtime is often costed on the basis of composite rates, even though military personnel are not paid for overtime. This justifies our approach. Another minor point about the model deserves mention. Recently federal raises have been effective on January 1. Any changes in medicare rates or caps are also effective on January 1. Thus savings are on a calendar year basis. However, if the timing of pay raises changes and calendar year results are still desired, either some fairly complicated changes in the model would be necessary or multiple runs would be necessary with time period ratios applied to the results. We elected not to program the model to adjust for this possibility since the results would be much more difficult for an auditor or the user to verify. Further refinement of the calculations would be a waste of time in view of the level of accuracy of pay raise factors, Army standard cost factors, the step 5 assumption, and user time savings estimates. Often the medicare cap is ignored completely in cost estimates.

2. OPERATION OF THE MODEL.

The terminal should be set to type all capital letters when running the model because yes or no questions need to be answered with Y or N. The model will treat y or n as an invalid response. Next a COMO file should be created by typing COMO, a space, and a filename. This will provide a record of the run and a means of checking if all inputs were as intended. Appendix C is the COMO file for a sample run. The model can then be initiated by typing SEG COSTMODEL. The first lines in the model define variables. Next, the user is instructed to set the terminal to all capital letter mode, if it is not already in that mode. Then the user is prompted to give the name of the input file containing cost factors and the name of the output file. AMSMC-MM has two input files to choose from entitled SCR.COSTS.GOV and SCR.COSTS.DOD. The files are opened and the variables initialized. The input file is then read free format. The user is then prompted for information identifying the project (submitting organization, date of submission, project title, description of project objective, and name and title of action officer). This information is then written to the output file. The user is then asked to choose one of two years for salaries. If the second year is chosen some values may be unknown and the model will perform calculations to estimate them. The model notes what was estimated since this will affect the text of the documentation of the estimate. The model then calculates overtime salaries for each GS grade. Next the model enters the time savings portion. The user is so informed and is instructed what to do. The title for the section of the output containing tables for each affected grade is written to the file. The user is then asked if time savings values will all be given in the same time unit. If so the user will be prompted to specify the time unit and will not need to enter a unit when time savings are given for individuals. The user is then prompted for a grade and the number of people affected at that grade. Per the instructions, grades must be entered in ascending order. If the user response is acceptable, the number of people affected is stored

and grade, salary, overtime salary, and headers for the table for the grade are written to the output file. If the number of people affected in the grade is more than one, the user is asked if all people in the grade have the same time savings. If so, the user will only need to make one time savings entry for the grade. The user is then prompted for this value or the savings for the first person in the grade. The model then computes savings including leave and holidays, and both savings values are converted to hours. The salary, fringe benefits, medicare, and total cost savings for the person are then computed both on the basis of new hires and overtime. There are no fringe benefits savings costing on the basis of overtime. The values are added to the grade totals and are then written to the output file. The process is repeated until all values have been printed for the grade. Then the values for the grade are added to the grand totals. Unless the grade just completed is GS 18, the model asks the user if there are more grades to be processed. When all grades have been processed, the title and headers for the table containing grade and grand totals are written to the output file. Then the total number of personnel affected is computed and the values for the table are written. After the model writes the documentation of the estimate, the user is informed that the output file may be spooled and files are then closed. The user should then type COMO -E to close the COMO file and spool the COMO and output files.

APPENDIX A

Cost Factor Input Data File for a Sample Run

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87 88
 10899. 11866. 13374. 15016. 16798. 18725. 20806. 23045. 25454. 28028. 30796. 33611. 43891. 51863. 61006. 71555. 72500. 72500.
 10899. 11866. 13374. 15016. 16798. 18725. 20806. 23045. 25454. 28028. 30796. 33611. 43891. 51863. 61006. 71555. 72500. 72500.
 0.18 0.0145 0.0145 0.3440 1.02 43800. 45000. 24732. 24732.
 'GOV' 0.2090

APPENDIX B

Output File for a Sample Run

SUBMITTING ORGANIZATION:

AMSMC-SAL

DATE OF SUBMISSION:

18DEC87

PROJECT TITLE:

XYZ SYSTEM CHANGE REQUEST

DESCRIPTION OF PROJECT OBJECTIVE:

AUTOMATE CALCULATION OF ABC VALUES

NAME AND TITLE OF ACTION OFFICER:

RICHARD E. MUSSEY, GS-12 OPERATIONS RESEARCH ANALYST

ANNUAL COST AND MANHOOR SAVINGS BY PERSON WITHIN GRADE

GRADE 1 SALARY = \$ 11117. OVERTIME SALARY = \$ 16676.

PERSON	NEW HIRE	NEW HIRE	ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
	OR OVT	+LV HOL	SALARY	MEDICARE	FRINGE	TOTAL	SALARY	MEDICARE	TOTAL
DIR HR	TOTAL HR	SAVINGS							
1	40.00	47.20	251.42	3.65	86.49	341.56	319.62	4.63	324.25
2	40.00	47.20	251.42	3.65	86.49	341.56	319.62	4.63	324.25

GRADE 2 SALARY = \$ 12103. OVERTIME SALARY = \$ 18155.

PERSON	NEW HIRE	NEW HIRE	ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
	OR OVT	+LV HOL	SALARY	MEDICARE	FRINGE	TOTAL	SALARY	MEDICARE	TOTAL
DIR HR	TOTAL HR	SAVINGS							
1	-40.00	-47.20	-273.72	-3.97	-94.16	-371.85	-347.96	-5.05	-353.01
2	40.00	47.20	273.72	3.97	94.16	371.85	347.96	5.05	353.01

GRADE 5 SALARY = \$ 17134. OVERTIME SALARY = \$ 25701.

PERSON	NEW HIRE	NEW HIRE	ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
	OR OVT	+LV HOL	SALARY	MEDICARE	FRINGE	TOTAL	SALARY	MEDICARE	TOTAL
DIR HR	TOTAL HR	SAVINGS							
1	40.00	47.20	387.51	5.62	133.30	526.43	492.59	7.14	499.73
2	80.00	94.40	775.01	11.24	266.60	1052.85	985.18	14.29	999.47

3	120.00	141.60	1162.52	16.86	399.91	1579.28	1477.78	21.43	1499.20
4	160.00	188.80	1550.02	22.48	533.21	2105.71	1970.37	28.57	1998.94
5	200.00	236.00	1937.53	28.09	666.51	2632.13	2462.96	35.71	2498.67
6	240.00	283.20	2325.04	33.71	799.81	3158.56	2955.55	42.86	2998.41
7	280.00	330.40	2712.54	39.33	933.11	3684.99	3448.15	50.00	3498.14
8	320.00	377.60	3100.05	44.95	1066.42	4211.41	3940.74	57.14	3997.88

GRADE 7 SALARY = \$ 21222. OVERTIME SALARY = \$ 31833.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
OR OVT	+LV HOL			FRINGE				OVERTIME		
DIR HR	TOTAL HR									
PERSON	SAVINGS	SAVINGS	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL	
1	10.00	11.80	119.99	1.74	41.28	163.01	152.53	2.21	154.74	

GRADE 9 SALARY = \$ 25963. OVERTIME SALARY = \$ 37841.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
OR OVT	+LV HOL			FRINGE				OVERTIME		
DIR HR	TOTAL HR									
PERSON	SAVINGS	SAVINGS	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL	
1	20.00	23.60	293.59	4.26	101.00	398.84	382.64	5.26	387.89	
2	20.00	23.60	293.59	4.26	101.00	398.84	382.64	5.26	387.89	

GRADE 11 SALARY = \$ 31412. OVERTIME SALARY = \$ 37841.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
OR OVT	+LV HOL			FRINGE				OVERTIME		
DIR HR	TOTAL HR									
PERSON	SAVINGS	SAVINGS	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL	
1	40.00	47.20	710.42	10.30	244.38	965.11	725.27	10.52	735.79	
2	40.00	47.20	710.42	10.30	244.38	965.11	725.27	10.52	735.79	
3	40.00	47.20	710.42	10.30	244.38	965.11	725.27	10.52	735.79	

GRADE 12 SALARY = \$ 37649. OVERTIME SALARY = \$ 37841.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
OR OVT	+LV HOL			FRINGE				OVERTIME		
DIR HR	TOTAL HR									
PERSON	SAVINGS	SAVINGS	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL	
1	173.92	205.22	3702.15	53.68	1273.54	5029.37	3153.42	45.72	3199.14	

GRADE 13 SALARY = \$ 44769. OVERTIME SALARY = \$ 37841.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING		
OR OVT	+LV HOL			FRINGE				OVERTIME		
DIR HR	TOTAL HR									
PERSON	SAVINGS	SAVINGS	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL	
1	12.53	14.79	317.17	4.60	109.11	430.87	227.19	3.29	230.49	
2	11.35	13.39	287.30	4.17	98.83	390.29	205.80	2.98	208.78	

GRADE 14 SALARY = \$ 52900. OVERTIME SALARY = \$ 37841.

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING OVERTIME		
OR OVT	+LV HOL	DIR HR	TOTAL HR	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL
PERSON	SAVINGS	SAVINGS								
1	5.00	5.90		149.55	1.84	51.45	202.84	90.66	0.00	90.66

ANNUAL COST AND MANHOUR SAVINGS BY GRADE AND TOTALS

NEW HIRE		NEW HIRE		ANNUAL DOLLAR SAVINGS COSTING NEW HIRES				ANNUAL DOLLAR SAVINGS COSTING OVERTIME		
OR OVT	+LV HOL	DIR HR	TOTAL HR	SALARY	MEDICARE	BENEFITS	TOTAL	SALARY	MEDICARE	TOTAL
GS GRADE	PEOPLE	SAVINGS	SAVINGS							
1	2	80.00	94.40	502.85	7.29	172.98	683.12	639.23	9.27	648.50
2	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	8	1440.00	1699.20	13950.21	202.28	4798.87	18951.36	17733.32	257.13	17990.45
7	1	10.00	11.80	119.99	1.74	41.28	163.01	152.53	2.21	154.74
9	2	40.00	47.20	587.18	8.51	201.99	797.69	725.27	10.52	735.79
11	3	120.00	141.60	2131.26	30.90	733.15	2895.32	2175.81	31.55	2207.36
12	1	173.92	205.22	3702.15	53.68	1273.54	5029.37	3153.42	45.72	3199.14
13	2	23.88	28.18	604.47	8.76	207.94	821.17	432.99	6.28	439.26
14	1	5.00	5.90	149.55	1.84	51.45	202.84	90.66	0.00	90.66
TOTALS	22	1892.80	2233.50	21747.66	315.02	7481.20	29543.87	25103.23	362.68	25465.91

DOCUMENTATION OF ESTIMATE

THE ESTIMATE IS IN 88 CONSTANT DOLLARS.

SALARIES ARE FOR STEP 5 OF EACH GRADE FOR 88.
 THE SALARIES WERE ESTIMATED BY USING THE SALARY SCHEDULE FOR 87 AND MULTIPLYING BY A PAY FACTOR OF 1.0200. BUDGET GUIDANCE IS GENERALLY THE SOURCE OF PAY FACTORS UNTIL A RAISE IS APPROVED. THE ONLY CIRCUMSTANCE WHICH COULD JUSTIFY USE OF ANOTHER PAY FACTOR WOULD BE IF BOTH CONGRESS AND THE PRESIDENT SUPPORT A LOWER RAISE OR BOTH SUPPORT A HIGHER RAISE. IN SUCH CASES THE FIGURE CLOSEST TO THE BUDGET GUIDANCE COULD BE USED.

THE MAXIMUM AMOUNT OF EARNINGS SUBJECT TO WITHHOLDING FOR MEDICARE IN 88 IS 45000.

OVERTIME SALARIES ARE 1.5 TIMES THE KNOWN OR ESTIMATED SALARY FOR STEP 5 OF A GRADE BUT NOT MORE THAN 1.5 TIMES THE KNOWN OR ESTIMATED SALARY FOR GS 10 STEP 1.

IN THIS ESTIMATE THE ACTUAL 87 SALARY OF 24732. FOR GS 10 STEP 1 WAS MULTIPLIED BY A PAY FACTOR OF 1.0200 TO GET AN ESTIMATED SALARY OF 25227. FOR GS 10 STEP 1 IN 88.

MULTIPLYING BY 1.5 YIELDS AN ESTIMATED MAXIMUM OVERTIME SALARY OF 37841. FOR 88.

METHODOLOGY FOR COSTING ON THE BASIS OF NEW HIRES IS AS FOLLOWS:

THE USER ENTERS THE DIRECT TIME FOR EACH PERSON IN THE TIME UNIT OF CHOICE. THE DIRECT TIME IS CONVERTED TO HOURS BY THE MODEL. THE DIRECT TIME IS THEN MULTIPLIED BY $(1 + 0.1800)$ TO GET THE TOTAL HOURS (INCLUDES LEAVE AND HOLIDAYS). TOTAL HOURS ARE MULTIPLIED BY THE ANNUAL SALARY AND DIVIDED BY 2087 HOURS PER YEAR TO GET THE SALARY COST VALUE FOR EACH PERSON. THE MEDICARE COST VALUE IS OBTAINED BY MULTIPLYING THE SALARY COST VALUE BY THE MEDICARE FACTOR OF 0.0145 UNLESS THE ANNUAL SALARY IS GREATER THAN THE MEDICARE CAP, IN WHICH CASE TOTAL HOURS ARE DIVIDED BY 2087 TO CONVERT TO YEARS AND THEN MULTIPLIED BY THE MEDICARE CAP AND THE MEDICARE FACTOR. THE FRINGE BENEFITS COST VALUE IS OBTAINED BY MULTIPLYING THE SALARY COST VALUE BY A FRINGE BENEFITS FACTOR TO INCLUDE ITEMS SUCH AS RETIREMENT, HEALTH AND LIFE INSURANCE, AWARDS, AND WORKERS' COMPENSATION. DOD FUNDS ONLY A PORTION OF CIVILIAN RETIREMENT COSTS (7% OF ANNUAL SALARY FOR CSRS EMPLOYEES). THIS ESTIMATE COMPUTES THE COST TO THE GOVERNMENT. A FRINGE BENEFITS FACTOR OF 0.3440 IS USED WHICH INCLUDES 0.2090 FOR CIVILIAN RETIREMENT COST NOT FUNDED BY DOD APPROPRIATIONS. THE TOTAL COST VALUE FOR EACH PERSON IS THE SUM OF THE SALARY, MEDICARE, AND FRINGE BENEFITS COST VALUES.

METHODOLOGY FOR COSTING ON THE BASIS OF OVERTIME IS AS FOLLOWS:

THE DIRECT TIME ENTERED BY THE USER FOR EACH PERSON IS CONVERTED TO HOURS. DIRECT HOURS ARE MULTIPLIED BY THE OVERTIME SALARY AND DIVIDED BY 2087 HOURS PER YEAR TO GET A SALARY COST VALUE FOR EACH PERSON. ONLY DIRECT HOURS ARE USED SINCE LEAVE AND HOLIDAYS ARE NOT EARNED WHILE WORKING OVERTIME. THERE ARE NO FRINGE BENEFITS COST VALUES SINCE NEITHER THE GOVERNMENT NOR THE EMPLOYEE PAY ANYTHING FOR ITEMS SUCH AS RETIREMENT AND INSURANCE ON OVERTIME EARNINGS. THE MEDICARE COST VALUE IS 0.00 FOR A PERSON IF THE ANNUAL BASE SALARY IS GREATER THAN OR EQUAL TO THE MEDICARE CAP. OTHERWISE THE MEDICARE COST VALUE EQUALS THE MEDICARE FACTOR OF 0.0145 TIMES THE LESSER OF: (1) THE SALARY COST VALUE, OR (2) THE DIFFERENCE BETWEEN THE MEDICARE CAP AND THE ANNUAL BASE SALARY. THE TOTAL COST VALUE FOR EACH PERSON IS THE SUM OF THE SALARY COST AND MEDICARE COST VALUES.

APPENDIX C

COMO File for a Sample Run

OK, SEG COSTMODEL

SET YOUR TERMINAL TO THE ALL CAPITAL LETTERS MODE IF IT
IS NOT ALREADY IN THAT MODE.

GIVE INPUT FILENAME CONTAINING COST FACTORS TO 20 CHAR
SAMPLE.INPUT

GIVE OUTPUT FILENAME UP TO 20 CHAR
SAMPLE.OUTPUT

YOU WILL NOW BE PROMPTED FOR INFORMATION TO IDENTIFY THE PROJECT.
RESPONSES CAN BE UP TO 80 CHARACTERS LONG.

SUBMITTING ORGANIZATION:
AMSMC-SAL

DATE OF SUBMISSION:
18DEC87

PROJECT TITLE:
XYZ SYSTEM CHANGE REQUEST

DESCRIPTION OF PROJECT OBJECTIVE:
AUTOMATE CALCULATION OF ABC VALUES

NAME AND TITLE OF ACTION OFFICER:
RICHARD E. MUSSER, GS-12 OPERATIONS RESEARCH ANALYST

ENTER 87 TO USE 87 SALARY SCHEDULE
OR 88 TO USE ACTUAL IF AVAILABLE OR PROJECTED 88 SALARIES
88

YOU ARE NOW ENTERING THE TIME SAVINGS PORTION OF THE MODEL.
FIRST YOU WILL BE ASKED IF ALL TIME SAVINGS WILL BE GIVEN
IN THE SAME TIME UNIT. IF SO YOU WILL BE PROMPTED FOR
THE TIME UNIT.
THEN YOU WILL BE PROMPTED FOR A GS GRADE AND THE NUMBER OF PEOPLE
AFFECTED AT THAT GRADE UP TO 100 PEOPLE.
ENTER GRADES IN ASCENDING ORDER.
THEN YOU WILL BE PROMPTED FOR THE TIME SAVINGS PER YEAR FOR EACH
PERSON AND THE UNIT OF THE SAVINGS IF NECESSARY.
INCLUDE A DEC. PT. IF NEC. IN TIME SAVINGS VALUES AND A MINUS
SIGN IF THERE IS A TIME INCREASE.
FOR UNIT ENTER THE FIRST TWO LETTERS OF ONE OF THE FOLLOWING:
YEARS, MONTHS, WEEKS, DAYS, HOURS, MINUTES, SECONDS.
ENTER JUST DIRECT TIME SAVINGS. THE MODEL HANDLES LEAVE
AND HOLIDAYS.

WILL ALL TIME SAVINGS VALUES BE GIVEN IN THE SAME TIME
UNIT (Y OR N)
N

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.
1 2

DO ALL PEOPLE AFFECTED AT GRADE 1 HAVE THE SAME TIME SAVINGS (Y OR N)
N

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 1.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
1
WE

GIVE TIME SAVINGS FOR PERSON 2 IN GRADE 1.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
5
DA

ARE THERE MORE GRADES (Y OR N)
Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.
2 2

DO ALL PEOPLE AFFECTED AT GRADE 2 HAVE THE SAME TIME SAVINGS (Y OR N)
N

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 2.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
-40
HO

GIVE TIME SAVINGS FOR PERSON 2 IN GRADE 2.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
40
HO

ARE THERE MORE GRADES (Y OR N)
Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.
5 8

DO ALL PEOPLE AFFECTED AT GRADE 5 HAVE THE SAME TIME SAVINGS (Y OR N)
N

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

1
WE

GIVE TIME SAVINGS FOR PERSON 2 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

2
WE

GIVE TIME SAVINGS FOR PERSON 3 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

3
WE

GIVE TIME SAVINGS FOR PERSON 4 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

4
WE

GIVE TIME SAVINGS FOR PERSON 5 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

5
WE

GIVE TIME SAVINGS FOR PERSON 6 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

6
WE

GIVE TIME SAVINGS FOR PERSON 7 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

7
WE

GIVE TIME SAVINGS FOR PERSON 8 IN GRADE 5.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

8
WE

ARE THERE MORE GRADES (Y OR N)
Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.

7 1

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 7.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

10
HO

ARE THERE MORE GRADES (Y OR N)
Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.

9 2

DO ALL PEOPLE AFFECTED AT GRADE 9 HAVE THE SAME TIME SAVINGS (Y OR N)

Y

GIVE TIME SAVINGS PER PERSON.

PUT THE VALUE ON ONE LINE AND THE TIME UNIT ON THE NEXT LINE.

20

HO

ARE THERE MORE GRADES (Y OR N)

Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.

11 3

DO ALL PEOPLE AFFECTED AT GRADE 11 HAVE THE SAME TIME SAVINGS (Y OR N)

N

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 11.

PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

40

HO

GIVE TIME SAVINGS FOR PERSON 2 IN GRADE 11.

PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

2400

MI

GIVE TIME SAVINGS FOR PERSON 3 IN GRADE 11.

PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

144000

SE

ARE THERE MORE GRADES (Y OR N)

Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.

12 1

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 12.

PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.

1

NO

ARE THERE MORE GRADES (Y OR N)

Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT

THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.
13 2

DO ALL PEOPLE AFFECTED AT GRADE 13 HAVE THE SAME TIME SAVINGS (Y OR N)
N

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 13.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
12.53
HO

GIVE TIME SAVINGS FOR PERSON 2 IN GRADE 13.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
11.35
HO

ARE THERE MORE GRADES (Y OR N)
Y

ENTER A GS GRADE AND THE NUMBER OF PEOPLE AFFECTED AT
THAT GRADE (1 TO 100 PEOPLE). ENTER BOTH ON THE SAME LINE
OR YOU CAN USE 2 LINES.
14 1

GIVE TIME SAVINGS FOR PERSON 1 IN GRADE 14.
PUT THE VALUE ON ONE LINE AND TIME UNIT ON NEXT.
5
HO

ARE THERE MORE GRADES (Y OR N)
N

YOU MAY SPOOL SAMPLE.OUTPUT -NOF.
**** STOP

OK. COMO -E

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